Emerging Communication Technologies for Wireless Sensor Networks: Current Investigation and Future Applications

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Abstract: Thispaperprovidesaviewaboutemerging communication technologies based on wireless sensor networks: current research and future applicationsanddescribes the additional sources and guides us for the application of this blue tooth technology in avoiding accidents in our daily transport. The Bluetooth protocol can be used forcommunication among vehicles equipped with Bluetooth devices. This work presents an approach to increase the safety of road travel using theconcepts of wireless sensor networks and the Bluetooth protocol. We discuss how vehicles can form mobile ad-hoc networks and exchange datasensed by the on-board sensors. The fusion of these data could give a better understanding of the surrounding traffic conditions. The feasibility ofusing Bluetooth for data exchange among vehicles is evaluated. Coverage area and probability of detection plots for isotropic and non-isotropicsensors are analysed to study their use to avoid potential dangerous situations in traffic.

Keywords: Wireless sensor network, Bluetooth, Design constraints.

1. Introduction

Wireless sensor network is composed of a plurality of sensor nodes with spatial distribution. Asynchronous clocks, observations asynchrony as well as information transmission delay is unavoidable. Consequently, considerable data from homogeneous or heterogeneous sensor nodes is processed when these sensors cooperate to complete the same task. Communication between electronic devices can only be achieved when they also abide

by   a   set   of predeterminedrulesandstandardslikeWirelesstechnology,whichisincreasinginourdaytodaylife,f orthedatabroadcasting.Itcan be of many forms, where the wireless communication is the "Cable-Replacement".   There   are   many wirelesscommunicationssuchasinfrared,Bluetoothetc.thatareexistingaroundusandhelpingusino urdailylifeinmanyways. out of which Bluetooth technology plays a vital role for the communication   which   is   helpful   to   people allovertheworldisgivenwithabroaddescriptionaboutitsfeatures,   applications andaboutitsdevelopment.

To understand relative positioning of each wireless standard it is important to first understand there are threeprimaryusage scenariosforwireless connectivity: WirelessPersonalAreaNetworking(WPAN), WirelessLocalAreaNetworking(WLAN) and WirelessWideAreaNetworking(WWAN). A schematic diagram of Bluetooth based wireless sensor networks with implementation issues and solutions is given in Figure 1.
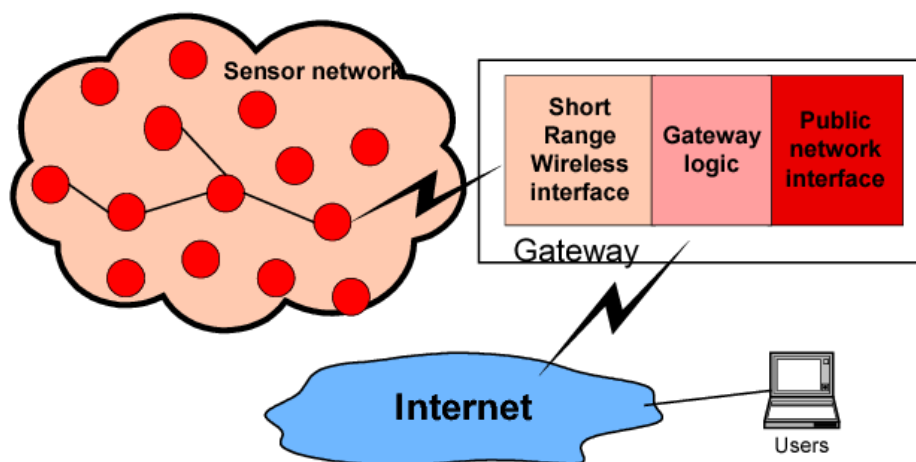
2. Design Methodology

Figure 1. Bluetooth-based WSN Deployment [1]

WLAN on the other is more focused on organizational connectivity not unlike wire based LAN connections. Theintent of WLAN technologies is to provide members of workgroups access   to   corporate   network   resources   be   itshareddata,sharedapplicationsore-mailbutdosoinwaythatdoesnotinhibitauser'smobility.Theemphasisisonapermanence ofthewirelessconnectionwithinadefined regionlikeanoffice buildingorcampus. Figure 2 shows a single-hop and multi-hop connected WSNs.
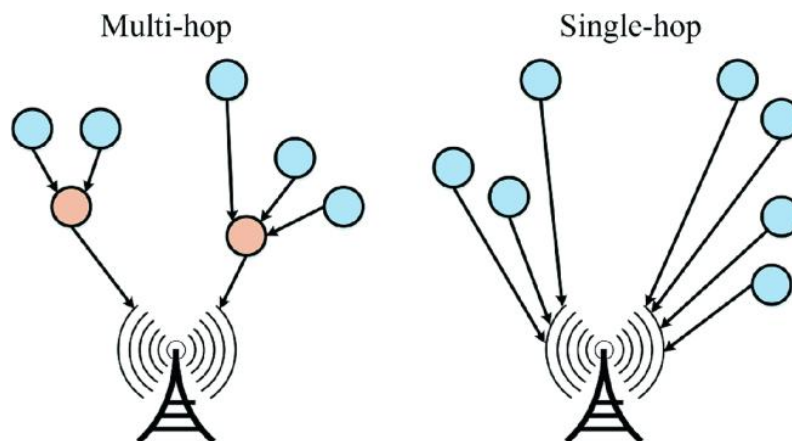
Figure 2. Single-hop and multi-hop connectivity in WSNs [2]

Bluetooth is a wireless technology (as Wireless PANs). Originally conceived as a low-power short range radiotechnology designed to replace cables for interconnecting devices such as printers, keyboards, and mice, itsperceived potential has evolved into far more sophisticated usage models. The requirement to do this in a totallyautomated, seamless, and user-friendly fashion, without adding appreciable cost, weight, or power drain to theassociated host is an enormous engineering challenge. Bluetooth is a cable-replacement technologydesigned to wirelessly connect peripherals, such as mice and mobile phones, to your desktop or laptop computerand to each other. An inexpensive, low-power, short-range radio-based technology, Bluetooth is not a wirelessnetworkingsolution,suchas AirPort.

3. Bluetooth-based WSN Connectivity

Although the IrDA standard, too,supportswirelesscommunicationbetweenperipheralsandcomputers,ithastwolimitingrequirements.First,IrDAdevices must be very close, no more than about1meter apart. Second, the communicating devices must have adirectLineofsighttoeachother.SinceBluetoothdevicesarecapableofmonitoringandcommunicatingwitheightother devices simultaneously. Let us examine just why we would want to connect without wires, and what itmightofferusintangibleterms;wecanusetheparadigmofourownPersonalAreaNetwork(PAN). WehaveaPCwith its ubiquitous mouse and keyboard, a laptop, a Personal Digital Assistant (PDA), a mobile phone with a"handsfree" kitanda printer. Figure 3 shows the mesh topology used in wireless sensor network.
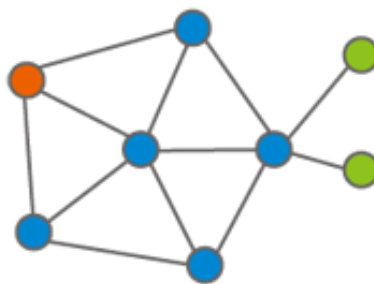
Figure 3. Mesh topology in a Wireless Sensor Network

Bluetooth is both a hardware-based radio system and a software stack that specifies the linkages between layers [3].Thissupportsflexibilityinimplementationacrossdifferentdevicesandplatforms.Italsoprovide srobustguidelinesformaximuminteroperabilityandcompatibility.Thistechnologyisdesignedtobe smallandinexpensive.Bluetoothtechnologyhasnolineofsightrequirementsmakingitapotentialre placementforinfraredports. Bluetooth can operate through walls or from within your briefcase. Portable PCs can wirelessly connect toprinters, transfer data to desktop PCs or PDAs, or interface with cellular phones for wireless WAN (Wide AreaNetworking)access tocorporate networksor the Internet [4].

Bluetoothovercomesthesestrictrequirements:Bluetoothdevicescancommunicateatrange sofupto10meters.Bluetoothdevicesdonotneedtobeindirectsightof each other. The typical components of a wireless sensor network is shown in Figure 4.
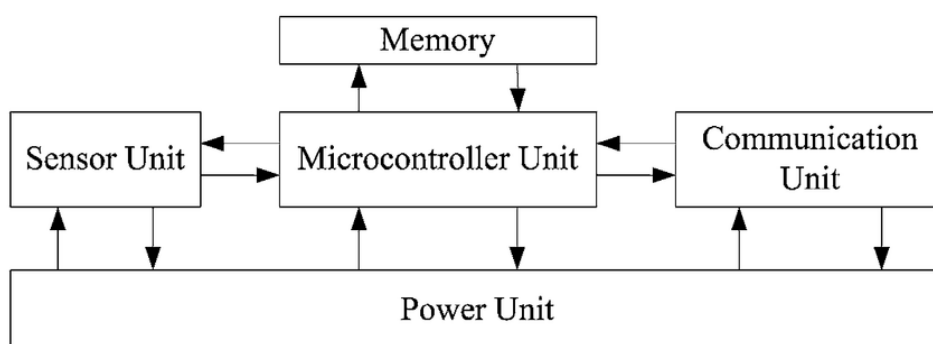
Figure 4. Building blocks of WSN

This makes Bluetooth communication much more flexible and robust. It's also important to note that becauseBluetooth excels at low-bandwidth data transfer, it is not intended as a

replacement for high-bandwidth cabledperipherals [5]-[6]. For high-bandwidth devices, such as external hard drives or video cameras, cables are still. Therearetwotypesofcontrolsignals.Firsttypeofsignalcontrolthespeedofthecarandthesecondtype ofsignalisto overtake thecar whichis movingforward.

4. Conclusion

The Bluetooth communication device will thus be a small, low powered radio in a chip that will talk to otherBluetoothenabledproducts.Bluetoothhasbeendesignedtosolveanumberofconnectivityprob lemsexperiencedby the mobile workers & consumers. Thus, this technology helps make the electronic devices more users friendlyandhelpsaddress various otherproblems like accidents.This paper provides a view about emerging communication technologies based on wireless sensor networks: current research and future applications and describes the additional sources and guides us for the application of this blue tooth technology in avoiding accidents in our daily transport.

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